



Alma Mater Studiorum - Università di Bologna  
DEPARTMENT OF ECONOMICS

**Trade Liberalization May Be Harmful under  
Endogenous Differentiation**

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*Quaderni - Working Paper DSE N° 262*



# Trade Liberalization May Be Harmful under Endogenous Differentiation\*

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May 29, 1996

## Abstract

The consequences of free trade are investigated in an international duopoly under horizontal differentiation and convex transportation costs. It is shown that the smaller country may benefit from trade if it is sufficiently small to allow for a significant volume of exports by the domestic firm. On the contrary, the larger country never benefits from trade, since liberalization decreases the domestic firm's profit and increases the amount of transportation costs borne by its inhabitants.

**JEL Classification:** F 12, F13, L 13

**Keywords:** autarky, free trade, horizontal differentiation

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\***Acknowledgements.** I wish to thank Giorgio Basevi, Roberto Cellini, Vincenzo Denicolò, Paolo Garella, Norman Ireland, Paul Klemperer, Gianpaolo Rossini, Carlo Scarpa and Martin Slater for insightful discussion and suggestions on an earlier draft, obviously without extending to any of them the responsibility, which remains with me only.

# 1 Introduction

Ever since the early studies due to Linder (1961) and Grubel and Lloyd (1975), consumers' preferences and product differentiation have been considered amongst the main factors at the basis of international trade.

The recent developments in the theory of international trade have promoted a wide stream of literature on intraindustry trade in differentiated commodities. Most of these contributions exploit the tools provided by the monopolistic competition paradigm *à la* Chamberlin (Dixit and Stiglitz, 1977), where product differentiation is exogenous (Krugman, 1979, 1980, 1981; Helpman, 1981, to mention only a few). Here, free entry ensures a zero-profit condition at equilibrium, under both autarky and free trade. Coupled with consumers' "love for variety", such a condition ensures that free trade increases welfare in all countries by simply increasing consumers' utility.

The address approach to product differentiation, where firms may strategically exploit the possibility of differentiating their respective production in order to acquire a non-negligible degree of market power, seems to put into question the main claim advocated by the literature mentioned above, namely, that liberalization brings about an increase in welfare by enlarging product variety. Moreover, the address approach assumes that each consumer can univocally rank available goods and identify his preferred variety, so that he can be characterized as an individual who shows a "love for specificity". This entails that the purchase of any commodity that does not entirely match his taste involves a welfare loss, which is very likely to happen whenever firms do have a significant market power. Though, the issue of endogenous product differentiation has been largely neglected by trade theorists. A few relevant exceptions are represented by Gabszewicz *et al.* (1981), Eaton and Kierzkowski (1984), Shaked and Sutton (1984) Schmitt (1990; 1995) and Motta (1992). All these papers consider a setting where profit-seeking firms first choose product variety and then compete in the market variable. Eaton and Kierzkowski (1984) adopt a spatial differentiation model *à la* Hotelling (1929) and show that (i) trade may *reduce* rather than increase product variety, and (ii) trade may lead to Pareto-inferior outcomes as compared to autarky. Schmitt (1990, 1995) address the issue of protection

in a spatial model of trade. Gabszewicz *et al.* (1981), Shaked and Sutton (1984) and Motta (1992) deals instead with vertical differentiation, showing that trade liberalization involves a tradeoff between the ability of developing and marketing goods characterized by higher quality levels than in autarky, and the exit of low-quality goods from the market, due to the increase in price competition.<sup>1</sup> This entails that no clearcut conclusion can be drawn as to the consequences of trade liberalization on social welfare.

Here, I address the issue of trade in horizontally differentiated commodities in a world where two countries of different size initially operate in a condition of autarkic monopoly. The opening of trade yields a duopoly where firms compete *à la* Bertrand, and one-way trade from the small to the large country is observed. In the short-run, varieties are given as in autarky, and firms can only adjust prices. I show that the impact effect of trade benefits the small country, provided that its firm exports a sufficiently large amount of production, while it damages the large country because (i) its firm is hurt by competition from abroad and (ii) its inhabitants must bear higher transportation costs than under autarky. Then, the long-run equilibrium arising when firms can also modify locations is analysed. It turns out that the conclusions previously drawn for the short-run equilibrium are strengthened, since the incentive to soften price competition leads firms to relocate farther apart and the disutility suffered by consumers increases. As a result, this model allows for two main claims. First, any increase in social welfare after the opening of trade stems from the increase in firms' profit, while the literature on monopolistic competition stresses that it can be expected to derive from an increase in consumers' utility. Second, the possibility that trade benefits all partners appears to be weak whenever firms have market power and may exploit product differentiation to enhance it. Specifically, the analysis presented below predicts that smaller partners may benefit from trade, while larger ones are to lose due to the extraction of consumer surplus operated by foreign producers, as well as the loss incurred by domestic firms that do not export. This also seems to weaken the relevance of the so-called "home market effect" highlighted by Krugman (1980) in the presence of increasing returns to scale.

The remainder of the paper is organized as follows. The basic setting and the autarkic equilibrium are outlined in Section 2. Sections 3 and 4 deal with the short-run and the long-run effects of free trade, respectively. A brief

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<sup>1</sup>The issue of protection under vertical differentiation is investigated by Krishna (1990).

comparison between them is then carried out in Section 5. Finally, Section 6 contains concluding remarks.

## 2 The model and the autarkic equilibrium

I adopt a horizontal differentiation setting which is a slight variation of the model due to D'Aspremont *et al.* (1979). Two firms operating in a linear world consisting of two countries sell the same physical good. Firm 1 is located in country 1, while firm 2 is located in country 2. They produce at the same constant marginal cost, which can be assumed to be nil without loss of generality.<sup>2</sup> Fixed costs are absent, so that relocation is costless. Consumers of both countries are uniformly distributed with density 1 along an interval whose total length can be normalised to 1. There is no discontinuity between the two countries, and the border is at  $\alpha \in ]0, 1[$ , so that consumers living in countries 1 and 2 are  $\alpha$  and  $1 - \alpha$ , respectively. This amounts to assuming that the distributions of preferences characterizing the two countries are contiguous, so that there exists no individual, say, in country 1 whose taste exactly corresponds to that of any individual living in country 2. Consumers have unit demands, and consumption yields a positive constant surplus  $s$ . Each consumer buys if and only if the net utility derived from purchase is non negative:

$$U = s - td_i^2 - p_i \geq 0, t > 0, i = 1, 2, \quad (1)$$

where  $td_i^2$  is the transportation cost<sup>3</sup> borne by the consumer living at distance  $d$  from firm  $i$ ,  $t$  is the unit transportation cost rate, and finally  $p_i$  is the price of variety  $i$ . Assume  $s > 5t/4$ . This is needed in order for total demand to be always equal to the total population of both countries under both autarky and free trade.

Under autarky, each firm sets a price such that the net surplus accruing to the marginal consumers living at the borders of each country, i.e., either 0, 1 or  $\alpha$ , is nil,

$$p_1^A = s - t(\alpha - x_1)^2; p_2 = s - t(1 - x_2)^2, \quad (2)$$

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<sup>2</sup>The introduction of a positive constant marginal cost would simply rescale equilibrium prices and profits, without affecting equilibrium locations and total transportation costs. See, e.g., Tirole (1988, p. 281).

<sup>3</sup>Convex transportation costs are necessary to ensure the existence of a duopolistic price equilibrium in pure strategies for any location pair. See D'Aspremont *et al.* (1979) and Economides (1986).

where apex  $A$  stands for *autarky*. Moreover, firms locate at the center of their respective countries,  $x_1 = \alpha/2$  and  $x_2 = (\alpha + 1)/2$ . These also represents the socially optimal locations in autarky,<sup>4</sup> minimizing total transportation costs  $SC_i$  in each country,

$$SC_1 = t \int_0^\alpha (m - x_1)^2 dm; SC_2 = t \int_\alpha^1 (m - x_2)^2 dm, \quad (3)$$

where  $m$  is the position of a generic consumer. It is easy to show that  $SC_i = -CS_i$ , where  $CS_i$  is consumer surplus in country  $i$ . The relevant equilibrium magnitudes are thus:

$$p_1^A = s - \frac{t}{4}\alpha^2; p_2^A = s - \frac{t}{4}(1 - \alpha)^2; \quad (4)$$

$$\pi_1^A = \frac{\alpha}{4}(4s - t\alpha^2); \pi_2^A = \frac{(1 - \alpha)}{4}[4s - t(1 - \alpha)^2]; \quad (5)$$

$$SC_1^A = -CS_1^A = \frac{t}{12}\alpha^3; SC_2^A = -CS_2^A = \frac{t}{12}(1 - \alpha)^3. \quad (6)$$

Total welfare in each country is measured by  $SW_i^A = \pi_i^A - SC_i^A$ . The impact effect of the opening of trade are dealt with in the next section.

### 3 Trade liberalization: Impact effects

Given the symmetry of the model, I assume that  $\alpha < 1/2$ , i.e., country 1 is smaller than country 2. As we shall see below, this assumption implies that the firm located in country 1 exports to country 2. As trade becomes free, firms noncooperatively adjust prices given the autarkic locations  $x_1 = \alpha/2$  and  $x_2 = (\alpha + 1)/2$ . Assume there is no market segmentation. For a generic price pair  $(p_1^S; p_2^S)$ , where superscript  $S$  stands for *short-run*, the location  $\tilde{m}$  of the consumer who is indifferent between the two varieties is implicitly given by the following condition:

$$p_1^S + \frac{t}{4}(2\tilde{m} - \alpha)^2 = p_2^S + \frac{t}{4}(\alpha + 1 - 2\tilde{m})^2. \quad (7)$$

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<sup>4</sup>Since the demand functions are linear in prices, the profit-seeking monopolist chooses the same location as the social planner (Spence, 1975, p. 421). See also Bonanno (1987).

Solving (7) w.r.t.  $\widetilde{m}$ , I obtain the market demand accruing to firm 1:

$$y_1^S = \widetilde{m} = \frac{(1 + 2\alpha)}{4} + \frac{(p_2^S - p_1^S)}{t}, \quad (8)$$

then, firm 2's demand is defined residually as

$$y_2^S = 1 - \widetilde{m} = \frac{(3 - 2\alpha)}{4} + \frac{(p_1^S - p_2^S)}{t}. \quad (9)$$

The profit function of firm  $i$  is thus:

$$\pi_i^S = p_i^S y_i^S. \quad (10)$$

The first order conditions are:

$$\frac{\partial \pi_1^S}{\partial p_1^S} = \frac{(1 + 2\alpha)}{4} + \frac{p_2^S - 2p_1^S}{t} = 0; \quad (11)$$

and

$$\frac{\partial \pi_2^S}{\partial p_2^S} = \frac{(3 - 2\alpha)}{4} + \frac{p_1^S - 2p_2^S}{t} = 0. \quad (12)$$

Solving (11-12), I obtain the equilibrium prices:

$$p_1^S = \frac{t}{12}(5 + 2\alpha); p_2^S = \frac{t}{12}(7 - 2\alpha). \quad (13)$$

Equilibrium demands are  $y_1^S = (5 + 2\alpha)/12$  and  $y_2^S = (7 - 2\alpha)/12$ , which clearly implies that firm 1 exports to country 2 if  $y_1^S > \alpha$ , that holds for  $\alpha < 1/2$ . Thus, the opening of trade entails an increase in firm 1's demand and a parallel decrease in the level of firm 2's sales as compared to autarky. Equilibrium profits amounts to:

$$\pi_1^S = \frac{t}{144}(5 + 2\alpha)^2; \pi_2^S = \frac{t}{144}(7 - 2\alpha)^2. \quad (14)$$

Total transportation costs under free trade are, respectively:

$$SC_1^S = \frac{t}{4} \int_0^\alpha (m - \alpha)^2 dm = \frac{t}{12} \alpha^3; \quad (15)$$

$$SC_2^S = \frac{t}{4} \left[ \int_\alpha^{\widetilde{m}} (m - \alpha)^2 dm + \int_{\widetilde{m}}^1 (\alpha + 1 - 2m)^2 dm \right]$$

$$= \frac{t}{288}(19 - 52\alpha + 52\alpha^2 - 24\alpha^3). \quad (16)$$

As to social welfare in the two countries, it amounts to:

$$SW_1^S = \frac{t}{144}(25 + 20\alpha + 4\alpha^2 - 12\alpha^3); \quad (17)$$

$$SW_2^S = \frac{t}{288}(79 - 4\alpha - 44\alpha^2 + 24\alpha^3). \quad (18)$$

I am now in a position to evaluate the short-run effect of trade liberalization. As to the effect on social welfare, it can be summarized in the following

**Proposition 1** *Trade liberalization may bring about an increase in the small country's welfare as compared to autarky, if the small country is sufficiently smaller than the large country, while it always decreases social welfare in the larger country.*

**Proof.** In order to show the above result, I evaluate the following differences:

$$SW_1^S - SW_1^A = \frac{25t - 144\alpha s + 20\alpha t + 4\alpha^2 t + 36\alpha^3 t}{144}; \quad (19)$$

$$SW_2^S - SW_2^A = \frac{175t - 288s + 288\alpha s - 292\alpha t + 244\alpha^2 t - 72\alpha^3 t}{288}. \quad (20)$$

Consider (19) first.  $SW_1^S - SW_1^A > 0$  if

$$s < \hat{s}_1 = \frac{t(25 + 20\alpha + 4\alpha^2 + 36\alpha^3)}{144\alpha}, \quad (21)$$

where  $\hat{s}_1$  is always positive and decreasing, with

$$\lim_{\alpha \rightarrow 0} \hat{s}_1 = \infty; \lim_{\alpha \rightarrow \frac{1}{2}} \hat{s}_1 = \frac{9}{16}t; \hat{s}_1 > \frac{5}{4}t \Leftrightarrow \alpha < 0.157756, \quad (22)$$

which implies that  $SW_1^S > SW_1^A$  for all  $\alpha \in ]0, 0.157756[$ , i.e., the impact effect of trade on social welfare in country 1 is favourable if and only if the latter is considerably smaller than country 2.

Turn now to (20).  $SW_2^S - SW_2^A > 0$  if

$$s < \hat{s}_2 = \frac{t(175 - 292\alpha + 244\alpha^2 - 72\alpha^3)}{288(1 - \alpha)}, \quad (23)$$



where  $\hat{s}_2$  is positive and convex in  $\alpha$ , with a minimum at  $\alpha = 0.33375$ , where  $\hat{s}_2 = 0.53183t$ , and

$$\lim_{\alpha \rightarrow 0} \hat{s}_2 = \frac{175}{288}t; \lim_{\alpha \rightarrow \frac{1}{2}} \hat{s}_2 = \frac{9}{16}t. \quad (24)$$

Provided that  $s \geq \frac{5}{4}t$  by assumption,  $SW_2^S < SW_2^A$  for all admissible values of  $\alpha$ . ■

In order to understand why trade liberalization has always a negative impact on the larger country's welfare, as well as on the smaller country's welfare in most of the cases, I proceed to decompose such effect by analysing the changes observed in profits and transportation costs in each country.

As to the impact effect on transportation costs, it is described in the following

**Proposition 2** *Trade liberalization leaves unchanged the transportation costs borne by consumers living in the small country, while it reduces the transportation costs incurred by consumers living in the large country.*

**Proof.** The first part of Proposition 2 can be quickly dealt with, by observing that

$$SC_1^S = \frac{t}{12}\alpha^3 = SC_1^A. \quad (25)$$

Concerning country 2, the change in total transportation costs amounts to

$$SC_2^S - SC_2^A = -\frac{5t}{288}(2\alpha - 1)^2, \quad (26)$$

which is always negative. ■

Hence, consumers living in the small country are unaffected by trade liberalization, since they keep being served by the domestic firm located at the same point as in autarky. On the other hand, consumers in the large country always benefit from trade. The intuition behind this result is straightforward, in that the opening of trade reduces the maximum distance between consumers and firms in the segment  $(\alpha, \frac{\alpha+1}{2})$ , i.e., between the consumer living at the border between the two countries, and firm 2's location.

I can finally concentrate on firms' profits. The short-run consequences of free trade on profits are summarized in

**Proposition 3** *Trade liberalization brings about an increase in profits for the firm operating in the smaller country, if the latter is sufficiently small, while it always decreases the profits accruing to the firm operating in the larger country.*

**Proof.** The second statement contained in the above Proposition is fairly intuitive. As trade opens, given the locations chosen in autarky, the demand accruing to firm 2 decreases because part of the consumers living in country 2 switches to firm 1. Moreover, firm 2's price decreases as compared to autarky, as a consequence of duopolistic competition. These considerations suffice to conclude that trade liberalization must exert a negative effect on profits as far as firm 2 is concerned.

As to firm 1, we have that

$$\pi_1^S - \pi_1^A = \frac{-144\alpha s + 25t + 20\alpha t + 4\alpha^2 t + 36\alpha^3 t}{144}, \quad (27)$$

which is positive if  $s < \hat{s}_1$ , where  $\hat{s}_1$  is defined as in (21). This implies that  $\pi_1^S > \pi_1^A$  for all  $\alpha \in ]0, 0.157756[$ , i.e., trade benefits the firm located in the smaller country if the latter is sufficiently small. ■

I am now able to give a comprehensive assessment of the short-run consequences of trade liberalization. As to the smaller country, they are clearcut. Provided that the location of firm 1 is fixed at the autarky position, trade has no effect on transportation costs borne by the population of the small country, since it is still being served by the domestic firm. As far as the latter is concerned, her profit may increase if the positive quantity effect, due to the fact that she now has access to a share of the foreign market, dominates the negative price effect, due to the Bertrand competition arising in the international duopoly setting. This appears to be the case when the firm operating in the smaller country serves a large number of consumers in the larger country, i.e., when  $\alpha$  is considerably small.

The impact effect of trade on the larger country's welfare is harmful because the domestic firm's profit decreases as a consequence of competition by the foreign firm, since the domestic firm suffers from a reduction in her output as well as in the price she can sustain in the duopolistic equilibrium as compared to autarky. Such a decrease in profits more than offset the decrease obtained in the transportation costs incurred by the inhabitants of the larger country.

It is worth observing that the above results could be alternatively considered as those emerging in correspondence of a long-run equilibrium in the case in which firms were to bear a sunk cost  $k_i$  in order to choose location (or product variety), that consequently could not be modified after the opening of trade.

## 4 Trade liberalization: Long-run effects

I am now in a position to evaluate the long-run consequences of the opening of trade, i.e., what happens when firms not only modify their respective prices, but also relocate as a reaction to liberalization. As in D'Aspremont *et al.* (1979), I assume that they choose their respective locations within the unit segment. Define the location of firm  $i$  as  $x_i \in [0, 1]$ . As in the previous section, I consider the case of fully integrated markets. Under such a hypothesis, market demands are defined as follows:

$$y_1^L = x_1 + \frac{(x_2 - x_1)}{2} + \frac{(p_2^L - p_1^L)}{2t(x_2 - x_1)} \quad (28)$$

$$\text{iff } x_1 + \frac{(x_2 - x_1)}{2} + \frac{(p_2^L - p_1^L)}{2t(x_2 - x_1)} \in ]0, 1[;$$

$$y_1^L = 1 \text{ iff } x_1 + \frac{(x_2 - x_1)}{2} + \frac{(p_2^L - p_1^L)}{2t(x_2 - x_1)} \geq 1; \quad (28')$$

$$y_1^L = 0 \text{ iff } x_1 + \frac{(x_2 - x_1)}{2} + \frac{(p_2^L - p_1^L)}{2t(x_2 - x_1)} \leq 0. \quad (28'')$$

$$y_2^L = 1 - \frac{(x_1 + x_2)}{2} + \frac{(p_1^L - p_2^L)}{2t(x_2 - x_1)} \quad (29)$$

$$\text{iff } 1 - \frac{(x_1 + x_2)}{2} + \frac{(p_1^L - p_2^L)}{2t(x_2 - x_1)} \in ]0, 1[;$$

$$y_2^L = 1 \text{ iff } 1 - \frac{(x_1 + x_2)}{2} + \frac{(p_1^L - p_2^L)}{2t(x_2 - x_1)} \geq 1; \quad (29')$$

$$y_2^L = 0 \text{ iff } 1 - \frac{(x_1 + x_2)}{2} + \frac{(p_1^L - p_2^L)}{2t(x_2 - x_1)} \leq 0. \quad (29'')$$

Superscript  $L$  stands for *long-run*. The equilibrium arising in such a case is well known (see D'Aspremont *et al.*, 1979; Tirole, 1988): firms 1 and 2 locate at 0 and 1, respectively.<sup>5</sup> Equilibrium prices are  $p_1^L = p_2^L = t$ , while demands are  $y_1^L = y_2^L = 1/2$ . Consequently, equilibrium profits amount to  $\pi_1^L = \pi_2^L = t/2$ . Moreover,

$$SC_1^L = -CS_1^L = \frac{t}{3}\alpha^3; SC_2^L = -CS_2^L = \frac{t}{12}(1 - 4\alpha^3); \quad (30)$$

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<sup>5</sup>If firms were allowed to locate also outside the unit segment, they would choose  $-1/4$  and  $5/4$ , respectively (see Anderson, 1988; Lambertini, 1994; Tabuchi and Thisse, 1995).

and, finally,

$$SW_1^L = \frac{t}{6}(3 - 2\alpha^3); SW_2^L = \frac{t}{12}(5 + 4\alpha^3). \quad (31)$$

Hence, I can state what follows:

**Proposition 4** *The long-run effect of trade liberalization on social welfare consists in (i) an increase in the welfare of the smaller country, if the latter is sufficiently small; and (ii) a decrease in the larger country's welfare, for all admissible values of  $\alpha$ .*

**Proof.** In order to prove part (i) of Proposition 4, it suffices to check that  $SW_1^L - SW_1^A$  is positive if

$$s < \bar{s}_1 = \frac{t}{2\alpha}, \quad (32)$$

where

$$\lim_{\alpha \rightarrow 0} \bar{s}_1 = \infty; \lim_{\alpha \rightarrow \frac{1}{2}} \bar{s}_1 = t; \bar{s}_1 > \frac{5}{4}t \Leftrightarrow \alpha < \frac{2}{5}, \quad (33)$$

which entails that  $SW_1^L - SW_1^A > 0$  if  $\alpha \in ]0, 2/5[$ .

As to claim (ii), observe that  $SW_2^L - SW_2^A > 0$  if

$$s < \bar{s}_2 = \frac{t(4\alpha^2 - 4\alpha + 3)}{4(1 - \alpha)}, \quad (34)$$

where  $\bar{s}_2 \in ]\frac{3}{4}t, t[$  for  $\alpha \in ]0, 1/2[$ . As a consequence, trade can never exert a positive effect on social welfare in the larger country. ■

I can now proceed to decompose the overall effect on social welfare into two separate elements, namely, the consequences of trade on firms' profits and transportation costs. As to the latter, the following holds:

**Proposition 5** *The relocation triggered by the opening of trade entails an increase in transportation costs borne by both countries.*

**Proof.** Consider the small country first. It can be immediately observed that  $SC_1^L = 4SC_1^A$ . Concerning the large country, we have that  $SC_2^L > SC_2^A$  if

$$-3\alpha(\alpha^2 + \alpha - 1) > 0, \quad (35)$$

which is true for all  $\alpha \in ]0, 1/2[$ . ■

The way trade liberalization affects profits in the long run is summarized in the following:

**Proposition 6** *Free trade may bring about an increase in the profit accruing to the firm operating in the smaller country, if the latter is sufficiently small, while it always hurts the firm operating in the larger country.*

**Proof.** The first part of Proposition 6 can be proved by checking that  $\pi_1^L > \pi_1^A$  if

$$s < \tilde{s}_1 = \frac{t}{4\alpha}(2 + \alpha^3), \quad (36)$$

and  $\tilde{s}_1 > 5t/4$  for all  $\alpha \in ]0, -1 + \sqrt{2}[$ . This entails that the long-run adjustment brings about an increase in firm 1's profit if her home country is small enough to allow for a significant volume of exports.

The second part of the Proposition is intuitive. Since both the price and the output of firm 2 decrease as compared to autarky, her long-run equilibrium profit is surely lower than in autarky. ■

## 5 Impact effects vs long-run equilibrium

The increase in differentiation observed in the adjustment process taking place after trade liberalization raises the question whether social welfare in the two countries is higher in the short-run equilibrium that obtains immediately after the opening of trade or in the long-run equilibrium generated by firms' relocation. The answer builds on the sum of the effects exerted by the increase in differentiation on firms' profit and consumers' disutility.

As far as the first effect is concerned, one can immediately claim that both firms' profit must be higher in the long-run than in the short-run equilibrium, because otherwise firms wouldn't have any incentive to locate further apart from each other. As to the effect on transportation costs, one can likewise assert that the overall amount of disutility suffered by consumers of both countries must be higher in the long-run than in the short-run equilibrium, since the minimum distance between firms and the consumer indifferent between them has increased. As a consequence, the net effect on welfare is, *a priori*, uncertain.

Consider country 1.  $SW_1^L > SW_1^S$  if

$$-\frac{t}{144}(36\alpha^3 + 4\alpha^2 + 20\alpha - 47) > 0, \quad (37)$$

which holds for all admissible values of  $\alpha$ . Hence, the increase in firm 1's profits outweighs the increase in transportation costs borne by the inhabitants of the small country, due to the extraction of surplus from country 2 through exports.

As to country 2,  $SW_2^L > SW_2^S$  if

$$-\frac{t}{288}(72\alpha^3 + 44\alpha^2 + 4\alpha + 41), \quad (38)$$

which is obviously positive, so that  $\pi_2^L - \pi_2^S > SC_2^L - SC_2^S$ . In summary, the following holds:

**Proposition 7** *The long-run equilibrium under free trade entails an increase in social welfare for both countries. Such increase is due to the fact that firms' profit increases more than transportation costs.*

## 6 Conclusions

I have investigated the consequences of trade liberalization in a two-country world under horizontal differentiation and convex transportation costs. Consumers' preferences are heterogenous and the distributions of tastes in the two countries are contiguous.

Each country is initially served in autarky by a domestic monopoly. The opening of trade brings about an adjustment first in prices and then also in locations. I have shown that the usual conclusion according to which trade liberalization is advantageous for all partners is reversed if firms have a strategic instrument such as endogenous differentiation that allows them to preserve a considerable degree of market power after the disappearance of trade barriers. Specifically, I have proved that a small country can benefit from trade if it is sufficiently small, in that in such a case its domestic firm exports a large share of her output to the larger country, thereby extracting surplus from the latter. In no circumstance the larger country can benefit from trade, since liberalization entails both a reduction of its domestic firm's profit and an increase in the transportation costs suffered by its inhabitants.

A possible extension of the present analysis would entail considering the possibility of partial overlapping between the distribution of preferences characterizing the two countries. Another promising aim would consist in embedding this model into a fully fledged general equilibrium framework.

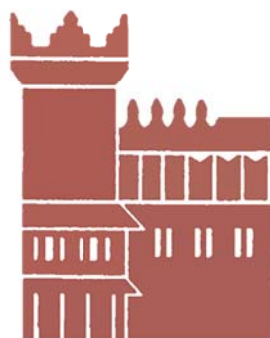
As a last remark, it is worth stressing that the above conclusions hold if one assumes away any possibility of further entry by outside competitors. If this were the case, it is well known the the entry process would end when price had reached marginal cost (which is nil in the model presented here), so that perfect competition would obtain. But here the incentive to enter the market is exactly the same under both autarky and free trade. As a consequence, as far as social welfare is concerned, no difference would be observed under free entry between the two regimes.

## References

- [1] Anderson, S. (1988), "Equilibrium Existence in the Linear Model of Spatial Competition", *Economica*, **55**, 479-491.
- [2] Bonanno, G. (1987), "Location Choice, Product Proliferation, and Entry", *Review of Economic Studies*, **54**, 37-46.
- [3] D'Aspremont, C., J.J. Gabszewicz and J.-F. Thisse (1979), "On Hotelling's 'Stability in Competition'", *Econometrica*, **47**, 1045-1050.
- [4] Dixit, A. and J. Stiglitz (1977), "Monopolistic Competition and Optimum Product Diversity", *American Economic Review*, **67**, 297-308.
- [5] Eaton, J. and H. Kierzkowski (1984), "Oligopolistic Competition, Product Variety, and International Trade", in H. Kierzkowski (ed.), *Monopolistic Competition and International Trade*, Oxford, Oxford University Press.
- [6] Economides, N. (1986), "Minimal and Maximal Differentiation in Hotelling's Duopoly", *Economics Letters*, **21**, 67-71.
- [7] Gabszewicz, J.J., A. Shaked, J. Sutton and J.-F. Thisse (1981), "International Trade in Differentiated Products", *International Economic Review*, **22**, 527-534.
- [8] Grubel, H.G. and P.J. Lloyd (1975), *Intra-Industry Trade*, London, Macmillan.
- [9] Helpman, E. (1981), "International Trade in the Presence of Product Differentiation, Economies of Scale and Monopolistic Competition: A Chamberlin-Heckscher-Ohlin Approach", *Journal of International Economics*, **11**, 305-340.
- [10] Hotelling, H. (1929), "Stability in Competition", *Economic Journal*, **39**, 41-57.
- [11] Krishna, K. (1990), "Protection and the Product Line: Monopoly and Product Quality", *International Economic Review*, **31**, 87-102.



- [12] Krugman, P. (1979), "Increasing Returns, Monopolistic Competition, and International Trade", *Journal of International Economics*, **9**, 469-479.
- [13] Krugman, P. (1980), "Scale Economies, Product Differentiation, and the Pattern of Trade", *American Economic Review*, **70**, 950-959.
- [14] Krugman, P. (1981), "Intra-Industry Specialization and the Gains from Trade", *Journal of Political Economy*, **89**, 959-973.
- [15] Lambertini, L. (1994), "Equilibrium Locations in the Unconstrained Hotelling Game", *Economic Notes*, **23**, 438-446.
- [16] Linder, S.B. (1961), *An Essay on Trade and Transformation*, New York, Wiley.
- [17] Motta, M. (1992), "Sunk Costs and Trade Liberalization", *Economic Journal*, **102**, 578-587.
- [18] Schmitt, N. (1990), "Two-Country Trade Liberalization in an Address Model of Product Differentiation", *Canadian Journal of Economics*, **23**, 654-675.
- [19] Schmitt, N. (1995), "Product Imitation, Product Differentiation and International Trade", *International Economic Review*, **36**, 583-608.
- [20] Shaked, A. and J. Sutton (1984), "Natural Oligopolies and International Trade", in H. Kierzkowski (ed.), *Monopolistic Competition and International Trade*, Oxford, Oxford University Press.
- [21] Spence, A.M. (1975), "Monopoly, Quality, and Regulation", *Bell Journal of Economics*, **6**, 417-429.
- [22] Tabuchi, T. and J.-F. Thisse (1995), "Asymmetric Equilibria in Spatial Competition", *International Journal of Industrial Organization*, **13**, 213-227.
- [23] Tirole, J. (1988), *The Theory of Industrial Organization*, Cambridge, Mass., MIT Press.



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